A-68944

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**
**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re application of:

STUART J. KNOWLES ET AL.

Serial No. 09/615,294

Filed: July 13, 2000

For: METHOD OF MANUFACTURING A TUNING FORK WITH REDUCED QUADRATURE ERROR AND SYMMETRICAL MASS BALANCING

Examiner:
Anthony Dexter Tugbang

Group Art Unit 3729

Confirmation No. 4777

December 5, 2006

## TRANSMITTAL OF SECOND CORRECTED APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In reply to the communication mailed November 28, 2006, applicant is submitting a second corrected appeal brief which includes the status of the amendment filed August 28, 2006.

The filing fee for the brief has already been paid, and the Commissioner is authorized to charge any additional fees, including extension fees, or to credit any overpayment, to Deposit Account 50-2975, Order No. A-68944.

Respectfully submitted,

Edward S. Wright

Edward S. Wright
Reg. No. 24,903

(650) 330-0830

**CERTIFICATE OF FACSIMILE TRANSMISSION**

**I CERTIFY THAT THE ATTACHED CORRECTED APPEAL BRIEF IS BEING FORWARDED TO THE PATENT OFFICE FOR FILING VIA FACSIMILE TRANSMISSION TO (571) 273-8300 ON December 5, 2006.**

Edward S. Wright

EDWARD S. WRIGHT

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# BRIEF ON APPEAL
## (Second Corrected)

Edward S. Wright
Law Offices of Edward S. Wright
1100 Alma Street, Suite 207
Menlo Park, CA 94025
(650) 330-0830 (Telephone)
(650) 330-0831 (Facsimile)

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## REAL PARTY IN INTEREST

The real party in interest is BEI Technologies, Inc., to whom the application has been assigned.

## RELATED APPEALS AND INTERFERENCES

None.

## STATUS OF CLAIMS

Claims 4 - 18 are pending in the application. Claim 9 has been allowed, and Claims 4 - 8 and 10 - 18 are on appeal.

The application was originally filed with Claims 1 - 13. Claims 1 - 3 were drawn to the product, and Claims 4 - 13 were drawn to the method of manufacture. Restriction was required, the method claims were elected, and the product claims were withdrawn from consideration. In an amendment filed December 14, 2001, Claims 4 - 12 were amended, and Claims 14 - 18 were added. Claims 14 and 16 were subsequently amended in an amendment filed February 14, 2003. Claims 4 - 18 were then allowed in an *Ex parte Quayle* action mailed August 11, 2004, in which the Examiner requested some formal amendments to the claims. In response to that action, non-elected Claims 1 - 3 were cancelled, and Claims 8, 14 and 15 were amended in light of the Examiner's suggestions in an amendment filed August 17, 2004. Four months later, "upon further consideration and careful review of the prior art", the Examiner reopened prosecution in an Office Action mailed December 17, 2004. Subsequently, in an amendment filed March 17, 2005, Claim 6 was once again amended. In an Office Action mailed July 19, 2005, the Examiner indicated that Claim 9 is directed to allowable subject matter, and Claim 9 was written in independent form in an amendment filed June 24, 2005. Claim 5 is being amended to correct a clerical in a amendment filed concurrently with this corrected brief.

## STATUS OF AMENDMENTS

The Amendment filed June 24, 2005 was filed concurrently with the Notice of Appeal, and has since been entered. A second amendment after final action was filed August 28, 2006, concurrently with the previous corrected brief, and it, too, has been entered. No other amendments have been filed since the action from which the appeal is taken.

## RELATED APPLICATIONS/PATENTS

U.S. Patent 6,701,785, issued March 9, 2004 on a division of the application on appeal. Its claims are directed to the product of the method which is the subject of the claims on appeal.

## SUMMARY OF CLAIMED SUBJECT MATTER

The claims on appeal are directed to a method of manufacturing a tuning fork for use in an inertial rate sensor. As discussed in the background section of applicant's



PAGE 5/18 * RCVD AT 12/5/2006 5:19:40 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-3/2 * DNIS:2738300 * CSID:650 330 0831 * DURATION (mm-ss):06-10

disclosure (Page 1, line 14 to Page 3, line 6), such tuning forks are subject to a problem known as quadrature error which arises from variations in the fabrication of the fork. The conventional way to eliminate quadrature error is to plate masses of material (typically gold) onto the ends of the tines and then selectively remove the material from one of the tines. That technique, however, has a significant disadvantage in that the two tines become unbalanced in mass, which degrades the performance of the sensor. The invention overcomes that problem by maintaining mass balance between the tines when quadrature error is reduced.

As defined by Claim 4, the method includes the steps of forming a pair of elongated tines (11, 12, Fig. 1) which have front and rear surfaces and are disposed symmetrically about an axis (17, Fig. 1), and using balancing masses on the front surface of one tine (26, 27, Fig. 2) and the rear surface of the other tine (28, 29, Fig. 2) to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. This method is discussed in detail on Pages 4 - 7 of the specification.

Claim 5 defines the method as including the steps of forming a pair of elongated tines (11, 12, Fig. 1) which have front and rear surfaces and are disposed symmetrically about an axis (17, Fig. 1), applying mass elements (26 - 29, Fig. 2) to the tines, and removing portions of the mass elements from the front surface of one tine and from the rear surface of the other to reduce quadrature displacement in the tines and maintain a balance in mass between the tines (Page 4, lines 19 - 28; Fig. 3).

Claim 6 defines the method as including the steps of forming a pair of elongated tines (11, 12, Fig. 1) which have front and rear surfaces and are disposed symmetrically about an axis (17, Fig. 1), and adding mass elements (26 - 29) to the front surface of one tine and the rear surface of the other tine to eliminate quadrature displacement in the tines and maintain a balance in mass between the tines (Page 5, lines 21 - 26; Fig. 2).

Claim 7 defines the method as including the steps of forming a pair of elongated tines (11, 12, Fig. 1) having free ends of increased lateral dimension (23, 24, Fig. 1) with laterally offset balancing masses (26 - 29) on opposite sides of the tines near the free ends, and adjusting the balancing masses on opposite sides of the two tines to reduce quadrature displacement in the tines and maintain a balance in mass between the tines (Page 4, lines 19 - 28).

Claim 8 depends from Claim 7 and further specifies that the balancing masses (26 - 29, Fig. 1) are adjusted by removing substantially equal amounts of the balancing masses from the opposite sides of the tines (Page 4, lines 19 - 21).

Claim 10 also depends from Claim 8 and further calls for the step of removing substantially equal amounts of the balancing masses (26 - 29, Fig. 1) from same sides of the tines to adjust the drive mode frequency of the tuning fork (Page 5, line 27 to Page 6, line 17).

Claim 11 defines the method as including the steps of forming an elongated pair of drive tines (11, 12, Fig. 1) having front and rear surfaces, forming a pair of pickup tines

(13, 14, Fig. 1) having front and rear surfaces, applying balancing masses (26 - 29, Fig. 1) to the front and rear surfaces of the drive tines, and trimming the balancing masses on opposite sides of the drive tines to reduce quadrature displacement without affecting mass balance between the drive tines (Page 4, lines 19 - 21).

Claim 12 depends from Claim 11 and further calls for the step of trimming the masses on same sides of the drive tines to adjust the drive mode frequency of the tuning fork (Page 5, line 27 to Page 6, line 17).

Claim 13 also depends from Claim 11 and further calls for the steps of providing masses (31, 32, Fig. 1) on the pickup tines, and trimming the masses on the pickup tines to adjust the pickup mode frequency of the tuning fork (Page 6, lines 13 - 17).

Claim 14 defines the method as including the steps of forming a pair of elongated tines (13, 14, Fig. 1) which have front and rear surfaces and are disposed symmetrically about an axis (17, Fig. 1), applying balancing masses (26 - 29, Fig. 1) to the front and rear surfaces of the tines, trimming the balancing masses if necessary to provide a balance in mass between the two tines (Page 6, lines 18 - 22), and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the tines and from the rear surface of the other tine to reduce quadrature displacement in the tines and maintain the balance in mass between tines (Page 6, lines 22 - 23).

Claim 15 depends from Claim 14 and further calls for the step of removing substantially equal amounts of the balancing masses from same sides of the tines to adjust the drive mode frequency of the tuning fork (Page 6, lines 9 - 13 and 22 - 23).

Claim 16 defines the method as including the steps of forming elongated pairs of drive and pickup tines (11, 12; 13, 14, Fig. 1) which have front and rear surfaces and extend in opposite directions from a central body(16, Fig. 1), applying balancing masses (26 - 29) to the front and rear surfaces of the drive tines, trimming the balancing masses if necessary to provide a balance in mass between the drive tines (Page 6, lines 18 - 22), and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the drive tines and from the rear surface of the other drive tine to reduce quadrature displacement in the drive tines and maintain the balance in mass between them (Page 6, lines 22 - 23).

Claim 17 depends from Claim 16 and further calls for the step of removing substantially equal amounts of the balancing masses from same sides of the drive tines to adjust the drive mode frequency of the tuning fork (Page 5, line 27 to Page 6, line 17).

Claim 18 also depends from Claim 16 and further calls for the steps of applying balancing masses (31, 32, Fig. 1) to the pickup tines, and removing substantially equal amounts of the balancing masses from same sides of the pickup tines to adjust the pickup mode frequency of the tuning fork (Page 6, lines 13 - 17).

## GROUNDS OF REJECTION

Claims 4 - 8 and 10 - 18 have been rejected under 35 U.S.C. §102 as being anticipated by Macy (U.S. 5,522,249).

Claims 4 - 8 and 10 - 18 have also been rejected under 35 U.S.C. §103 as being obvious from Macy.

## GROUPING OF CLAIMS

It is not acceptable to applicant to have the claims stand or fall together within the groups in which they have been rejected. Different claims include an different limitations, and the Board could very well find that at least some of the claims are directed to patentable subject matter even if it were to affirm the Examiner's rejection of others.

## ARGUMENT

### Section 102 Rejection

In order to be a proper basis for rejection under 35 U.S.C. §102, a reference must show each and every element of the claimed invention, which Macy clearly does not do. There is a fundamental difference between applicant's invention and the teachings of Macy, which the Examiner apparently does not understand.

While applicant's invention and Macy may both be concerned with the elimination of quadrature error, they do so in different ways. In Macy, the pickup electrodes are trimmed to produce an electrical null in the quadrature signal, whereas in applicant's invention balancing masses are utilized to eliminate quadrature vibration and to maintain a balance in mass between the tines. One is an electrical technique; the other is mechanical.

The electrical balancing technique of Macy is quite different than applicant's invention. In the single-ended tuning fork of Macy, piezoelectrically induced drive charge is present on the pickup electrodes. If this charge is not perfectly symmetrical in its distribution on the various pickup electrodes, there will be a net quadrature signal in the output since the drive charge signal is in quadrature phase relation to the rotation-induced Coriolis signal. By trimming away electrode area, an intentional change in the electrode symmetry is created to produce an electrical nulling of the quadrature signal.

Moreover, contrary to the Examiner's suggestion, the pickup electrodes in Macy are not balancing masses. Their function is to provide electrically conductive regions for sensing piezoelectrically induced charge, and their mass is insignificant. Such electrodes are typically only 100 - 200 nm thick, whereas balancing masses as employed in applicant's invention may be as thick as 10,000 nm and a relatively heavy metal such as gold.

The location of the pickup electrodes relatively close to the base of the tines in Macy also makes their mass less significant since they are farther away from the free ends of the tines which move with significantly more velocity than the areas near the base.

In contrast, in applicant's invention, there is a true mechanical balancing in which the mechanical properties of the tines are altered such that the actual quadrature displacement in the pickup mode of vibration is reduced or eliminated.

Macy was also cited in the divisional application on which U.S. Patent 6,701,785 has now issued, and the Examiner in that application initially mischaracterized the electrodes as balancing masses and made arguments similar to those made by the Examiner in this application. Ultimately, however, the claims in that application were allowed when applicant pointed out that the electrodes in Macy are not balancing masses and that the balancing in Macy is electrical, not mechanical. These differences are even more significant with the method claims than with the product claims because they involve not only the use of the balancing masses but also the manner in which they are trimmed.

**Claim 4**

Claim 4 distinguishes over Macy in calling for the steps of forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, and using balancing masses on the front surface of one tine and the rear surface of the other tine to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. The electrodes shown in Macy are not balancing masses. They are not used to maintain a balance in mass between the tines, and there is no suggestion of using balancing masses on the front surface of one tine and the rear surface of the other. Likewise, there is no suggestion of using balancing masses to reduce quadrature error. Hence, Macy clearly does not anticipate the invention.

**Claim 5**

Claim 5 distinguishes over Macy in calling for the steps of forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, applying mass elements to the tines, and removing portions of the mass elements from the front surface of one tine and from the rear surface of the other to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. Macy does not teach or suggest the application of balancing masses, and it certainly does not show or suggest removing portions of the masses from the front surface of one tine and the rear surface of the other, and it likewise does not teach or suggest the removal of mass from such surfaces to reduce quadrature displacement or to maintain a balance in mass. Hence, Macy does not anticipate Claim 5 either.

**Claim 6**

Claim 6 distinguishes over Macy in calling for the steps of forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, and adding mass elements to the front surface of one tine and the rear surface of the other tine to eliminate quadrature displacement in the tines and maintained a balance in mass between the tines. Here again, Macy does not teach or suggest the addition of mass elements to the front surface of one tine and the rear surface of the other, nor does it show or suggest the addition of mass elements to eliminate quadrature error or to maintain a balance in mass between the tines. Hence, it does not anticipate Claim 6.

**Claim 7**

Claim 7 distinguishes over Macy in calling for the steps of forming a pair of elongated tines having free ends of increased lateral dimension with laterally offset balancing masses on opposite sides of the tines near the free ends, and adjusting the balancing masses on opposite sides of the two tines to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. Macy does not show or suggest the formation of tines having either free ends of increased lateral dimension or laterally offset balancing masses on opposite sides of the tines near the free ends, nor does it show or suggest adjusting the balancing masses on opposite sides of the two tines to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. Without those steps, it does not anticipate Claim 7.

**Claims 8 and 10**

Claims 8 and10 depend from Claim 7 and are directed to patentable subject matter for the same reasons as their parent claim. In addition, Claim 7 further distinguishes over Macy in specifying that the balancing masses are adjusted by removing substantially equal amounts of the balancing masses from the opposite sides of the tines, and Claim 10 further distinguishes in calling for the step of removing substantially equal amounts of the balancing masses from same sides of the tines to adjust the drive mode frequency of the tuning fork. Those steps are not found in Macy, and without them, Macy does not anticipate.

**Claim 11**

Claim 11 distinguishes over Macy in calling for the steps of forming an elongated pair of drive tines having front and rear surfaces, forming a pair of pickup tines having front and rear surfaces, applying balancing masses to the front and rear surfaces of the drive tines, and trimming the balancing masses on opposite sides of the drive tines to reduce quadrature displacement without affecting mass balance between the drive tines. Macy does not show or suggest either the application of balancing masses to the front and rear surfaces of drive tines or trimming balancing masses on opposite sides of the drive tines to reduce quadrature displacement without affecting mass balance between the drive tines. Hence, it does not anticipate.

**Claims 12 and 13**

Claims 12 and 13 depend from Claim 11 and are directed to patentable subject matter for the same reasons as their parent claim. In addition, Claim 12 further distinguishes in calling for the step of trimming the masses on same sides of the drive tines to adjust the drive mode frequency of the tuning fork, and Claim 13 further distinguishes in calling for the steps of providing masses on the pickup tines, and trimming the masses on the pickup tines to adjust the pickup mode frequency of the tuning fork. Without those steps, Macy does not anticipate.

**Claim 14**

Claim 14 distinguishes over Macy in calling for the steps of forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, applying balancing masses to the front and rear surfaces of the tines, trimming the balancing masses if necessary to provide a balance in mass between the two tines, and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the tines and from the rear surface of the other tine to reduce quadrature displacement in the tines and maintain the balance in mass between tines. Without those steps, Macy does not anticipate.

**Claim 15**

Claim 15 depends from Claim 14 and is directed to patentable subject matter for the same reasons as its parent claim. In addition, it further distinguishes in calling for the step of removing substantially equal amounts of the balancing masses from same sides of the tines to adjust the drive mode frequency of the tuning fork.

**Claim 16**

Claim 16 distinguishes over Macy in calling for the steps of forming elongated pairs of drive and pickup tines which have front and rear surfaces and extend in opposite directions from a central body, applying balancing masses to the front and rear surfaces of the drive tines, trimming the balancing masses if necessary to provide a balance in mass between the drive tines, and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the drive tines and from the rear surface of the other drive tine to reduce quadrature displacement in the drive tines and maintain the balance in mass between them. Macy does not show or suggest applying balancing masses to the front and rear surfaces of the drive tines, trimming the balancing masses if necessary to provide a balance in mass between the drive tines, and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the drive tines and from the rear surface of the other drive tine to reduce quadrature displacement in the drive tines and maintain the balance in mass between the tines. Without those steps, Macy certainly does not anticipate.

**Claims 17 and 18**

Claims 17 and 18 depend from Claim 16 and are directed to patentable subject matter for the same reasons as their parent claim. In addition, Claim 17 further distinguishes in calling for the step of removing substantially equal amounts of the balancing masses from same sides of the drive tines to adjust the drive mode frequency of the tuning fork, and Claim 18 further distinguishes in calling for the steps of applying balancing masses to the pickup tines and removing substantially equal amounts of the balancing masses from same sides of the pickup tines to adjust the pickup mode frequency of the tuning fork.

**Section 103 Rejection**

In support of the obviousness rejection, the Examiner simply argues that if removing or adjusting the balancing masses on "opposite sides" of the tines, the "same sides" of the tines or from the "front surface of one tine and the rear surface of the other" is not inherent in Macy, then it would have been obvious to do so because Macy because "Macy attempts to solve his very own problem of symmetry and balance with balancing of masses or mass elements (electrodes)", citing Col. 4, lines 46 *et seq.* of Macy. In so doing, the Examiner has failed to address a single one of the 14 or 15 claims which are included in the rejection. Moreover, the argument is based on the mischaracterization of the electrodes as balancing masses, and it continues to overlook or ignore the difference between mass balancing and electrical balancing. Furthermore, it overlooks or ignores the fact that it is very important that the masses be removed from the surfaces specified and not others.

The portion of Macy cited by the Examiner (Col. 4, line 46 *et seq.*) is not concerned with mass balancing at all, but rather with arranging the electrical leads on the tines in a symmetrical manner in order to minimize capacitive coupling between them.

The simple fact is that Macy does not teach or even remotely suggest the use or removal of balancing masses in the manner of applicant's invention, and it certainly does not suggest removing such masses from the specific surfaces set forth in the claims.

**Claim 4**

As discussed above, Claim 4 distinguishes over Macy in calling for the steps of forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, and using balancing masses on the front surface of one tine and the rear surface of the other tine to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. The electrodes shown in Macy are not balancing masses. They are not used to maintain a balance in mass between the tines, and there is no suggestion of using balancing masses on the front surface of one tine and the rear surface of the other. Likewise, there is no suggestion of using balancing masses to reduce quadrature error. Those steps are not inherent in Macy, they even remotely suggested by it, and the Examiner has failed to make even a *prima facie* case of obviousness.

**Claim 5**

Claim 5 distinguishes over Macy in calling for the steps of forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, applying mass elements to the tines, and removing portions of the mass elements from the front surface of one tine and from the rear surface of the other to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. Macy does not teach or suggest the application of balancing masses, and it certainly does not show or suggest removing portions of the masses from the front surface of one tine and the rear surface of the other, and it likewise does not teach or suggest the

removal of mass from such surfaces to reduce quadrature displacement or to maintain a balance in mass. Here again, the steps are not inherent in Macy, they are not even remotely suggested by it, and the Examiner has once again failed to make a *prima facie* case of obviousness.

**Claim 6**

Claim 6 distinguishes over Macy in calling for the steps of forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, and adding mass elements to the front surface of one tine and the rear surface of the other tine to eliminate quadrature displacement in the tines and maintained a balance in mass between the tines. Here again, Macy does not teach or suggest the addition of mass elements to the front surface of one tine and the rear surface of the other, nor does it show or suggest the addition of mass elements to eliminate quadrature error or to maintain a balance in mass between the tines. Once again, the Examiner has failed to make even a *prima facie* case of obviousness.

**Claim 7**

Claim 7 distinguishes over Macy in calling for the steps of forming a pair of elongated tines having free ends of increased lateral dimension with laterally offset balancing masses on opposite sides of the tines near the free ends, and adjusting the balancing masses on opposite sides of the two tines to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. Macy does not show or suggest the formation of tines having either free ends of increased lateral dimension or laterally offset balancing masses on opposite sides of the tines near the free ends, nor does it show or suggest adjusting the balancing masses on opposite sides of the two tines to reduce quadrature displacement in the tines and maintain a balance in mass between the tines. Without those steps, there is no basis for the rejection which the Examiner has made.

**Claims 8 and 10**

Claims 8 and10 depend from Claim 7 and are directed to patentable subject matter for the same reasons as their parent claim. In addition, Claim 7 further distinguishes over Macy in specifying that the balancing masses are adjusted by removing substantially equal amounts of the balancing masses from the opposite sides of the tines, and Claim 10 further distinguishes in calling for the step of removing substantially equal amounts of the balancing masses from same sides of the tines to adjust the drive mode frequency of the tuning fork. Those steps are not found in Macy, and the Examiner has once again failed to make even a *prima facie* case of obviousness.

**Claim 11**

Claim 11 distinguishes over Macy in calling for the steps of forming an elongated pair of drive tines having front and rear surfaces, forming a pair of pickup tines having front and rear surfaces, applying balancing masses to the front and rear surfaces of the drive tines, and trimming the balancing masses on opposite sides of the drive tines to

reduce quadrature displacement without affecting mass balance between the drive tines. Macy does not show or suggest either the application of balancing masses to the front and rear surfaces of drive tines or trimming balancing masses on opposite sides of the drive tines to reduce quadrature displacement without affecting mass balance between the drive tines. Here again, the Examiner has once again failed to make even a *prima facie* case of obviousness.

**Claims 12 and 13**

Claims 12 and 13 depend from Claim 11 and are directed to patentable subject matter for the same reasons as their parent claim. In addition, Claim 12 further distinguishes in calling for the step of trimming the masses on same sides of the drive tines to adjust the drive mode frequency of the tuning fork, and Claim 13 further distinguishes in calling for the steps of providing masses on the pickup tines, and trimming the masses on the pickup tines to adjust the pickup mode frequency of the tuning fork. Without those steps, there is no basis for the rejection which the Examiner has made.

**Claim 14**

Claim 14 distinguishes over Macy in calling for the steps of forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, applying balancing masses to the front and rear surfaces of the tines, trimming the balancing masses if necessary to provide a balance in mass between the two tines, and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the tines and from the rear surface of the other tine to reduce quadrature displacement in the tines and maintain the balance in mass between tines. Those steps are not even remotely suggested by Macy, and once again there is not even a case of *prima facie* obviousness.

**Claim 15**

Claim 15 depends from Claim 14 and is directed to patentable subject matter for the same reasons as its parent claim. In addition, it further distinguishes in calling for the step of removing substantially equal amounts of the balancing masses from same sides of the tines to adjust the drive mode frequency of the tuning fork. This likewise is not even remotely suggested by Macy, and there is no obviousness.

**Claim 16**

Claim 16 distinguishes over Macy in calling for the steps of forming elongated pairs of drive and pickup tines which have front and rear surfaces and extend in opposite directions from a central body, applying balancing masses to the front and rear surfaces of the drive tines, trimming the balancing masses if necessary to provide a balance in mass between the drive tines, and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the drive tines and from the rear surface of the other drive tine to reduce quadrature displacement in the drive tines and maintain the balance in mass between them. Macy does not show or suggest applying balancing masses to the front and rear surfaces of the drive tines, trimming the balancing

masses if necessary to provide a balance in mass between the drive tines, and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the drive tines and from the rear surface of the other drive tine to reduce quadrature displacement in the drive tines and maintain the balance in mass between the tines. With no suggestion of those steps, there is no obviousness.

**Claims 17 and 18**

Claims 17 and 18 depend from Claim 16 and are directed to patentable subject matter for the same reasons as their parent claim. In addition, Claim 17 further distinguishes in calling for the step of removing substantially equal amounts of the balancing masses from same sides of the drive tines to adjust the drive mode frequency of the tuning fork, and Claim 18 further distinguishes in calling for the steps of applying balancing masses to the pickup tines and removing substantially equal amounts of the balancing masses from same sides of the pickup tines to adjust the pickup mode frequency of the tuning fork. Here again, those steps are not even remotely suggested by Macy, and there is no obviousness.

## SUMMARY AND CONCLUSION

It is respectfully submitted that the rejections which the Examiner has made cannot be sustained and that the action of the Examiner should be reversed.

Respectfully submitted,

Edward S. Wright

Edward S. Wright
Reg. No. 24,903

(650) 330-0830

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## The Claims on Appeal

4. In a method of manufacturing a tuning fork for use in an inertial rate sensor, the steps of: forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, and using balancing masses on the front surface of one tine and the rear surface of the other tine to reduce quadrature displacement in the tines and maintain a balance in mass between the tines.

5. In a method of manufacturing a tuning fork for use in an inertial rate sensor, the steps of: forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, applying mass elements to the tines, and removing portions of the mass elements from the front surface of one tine and from the rear surface of the other to reduce quadrature displacement in the tines and maintain a balance in mass between the tines.

6. In a method of manufacturing a tuning fork for use in an inertial rate sensor, the steps of: forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, and adding mass elements to the front surface of one tine and the rear surface of the other tine to eliminate quadrature displacement in the tines and maintain a balance in mass between the tines.

7. In a method of manufacturing a tuning fork for use in an inertial rate sensor, the steps of: forming a pair of elongated tines having free ends of increased lateral dimension with laterally offset balancing masses on opposite sides of the tines near the free ends, and adjusting the balancing masses on opposite sides of the two tines to reduce quadrature displacement in the tines and maintain a balance in mass between the tines.

8. The method of Claim 7 wherein the balancing masses are adjusted by removing substantially equal amounts of the balancing masses from the opposite sides of the tines.

10. The method of Claim 7 further including the step of removing substantially equal amounts of the balancing masses from same sides of the tines to adjust the drive mode frequency of the tuning fork.

11. In a method of manufacturing a tuning fork for use in an inertial rate sensor, the steps of: forming an elongated pair of drive tines having front and rear surfaces, forming a pair of pickup tines having front and rear surfaces, applying balancing masses to the front and rear surfaces of the drive tines, and trimming the balancing masses on opposite sides of the drive tines to reduce quadrature displacement without affecting mass balance between the drive tines.

12. The method of Claim 11 further including the step of trimming the masses on same sides of the drive tines to adjust the drive mode frequency of the tuning fork.


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13. The method of Claim 11 further including the steps of providing masses on the pickup tines, and trimming the masses on the pickup tines to adjust the pickup mode frequency of the tuning fork.

14. In a method of manufacturing a tuning fork for use in an inertial rate sensor, the steps of: forming a pair of elongated tines which have front and rear surfaces and are disposed symmetrically about an axis, applying balancing masses to the front and rear surfaces of the tines, trimming the balancing masses if necessary to provide a balance in mass between the two tines, and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the tines and from the rear surface of the other tine to reduce quadrature displacement in the tines and maintain the balance in mass between tines.

15. The method of Claim 14 further including the step of removing substantially equal amounts of the balancing masses from same sides of the tines to adjust the drive mode frequency of the tuning fork.

16. In a method of manufacturing a tuning fork for use in an inertial rate sensor, the steps of: forming elongated pairs of drive and pickup tines which have front and rear surfaces and extend in opposite directions from a central body, applying balancing masses to the front and rear surfaces of the drive tines, trimming the balancing masses if necessary to provide a balance in mass between the drive tines, and thereafter removing substantially equal amounts of the balancing masses from the front surface of one of the drive tines and from the rear surface of the other drive tine to reduce quadrature displacement in the drive tines and maintain the balance in mass between them.

17. The method of Claim 16 further including the step of removing substantially equal amounts of the balancing masses from same sides of the drive tines to adjust the drive mode frequency of the tuning fork.

18. The method of Claim 16 further including the steps of applying balancing masses to the pickup tines, and removing substantially equal amounts of the balancing masses from same sides of the pickup tines to adjust the pickup mode frequency of the tuning fork.

## Appendix B - Copies of Evidence Submitted

None

## Appendix C - Copies of Decisions in Related Appeals and Interferences

None